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Validation and Optimization Testing of a Target Fueled Isotope Production Reactor

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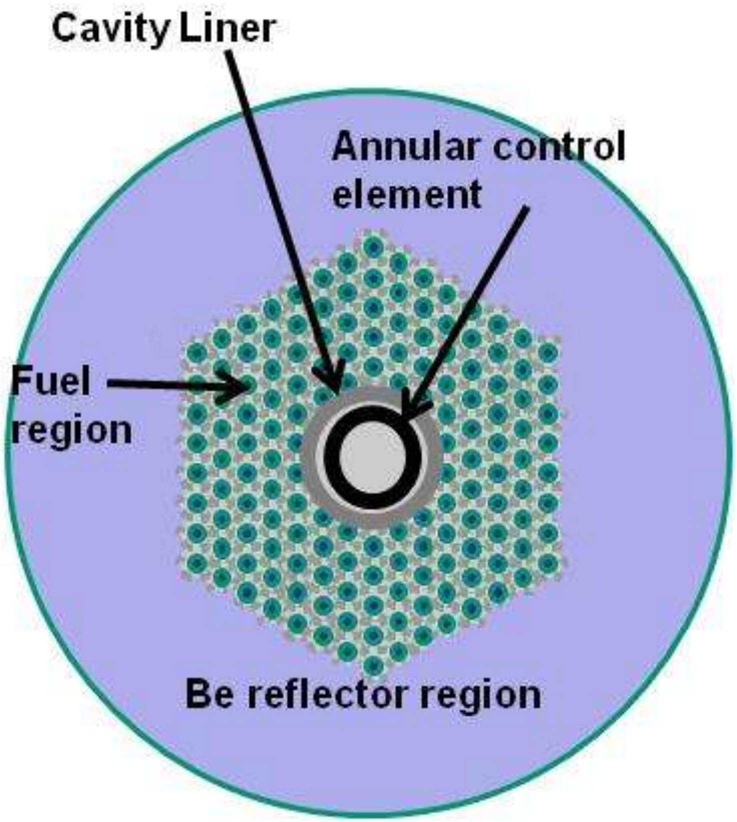
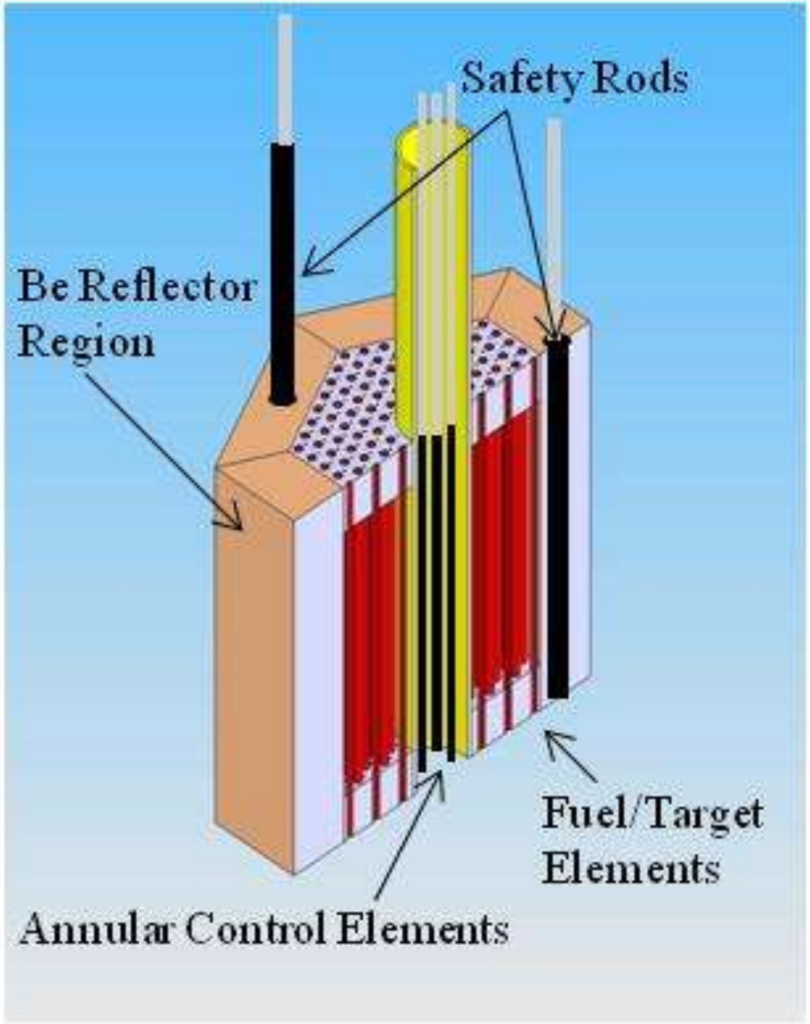
Topics

- **Reactor Design Concept**
- **Approach to Critical Experiments**
- **Target/Fuel Thermo-Hydraulic Tests**
- **Burnup and Transient Fuel Tests**
- **Conclusions**

Reactor Design Concept



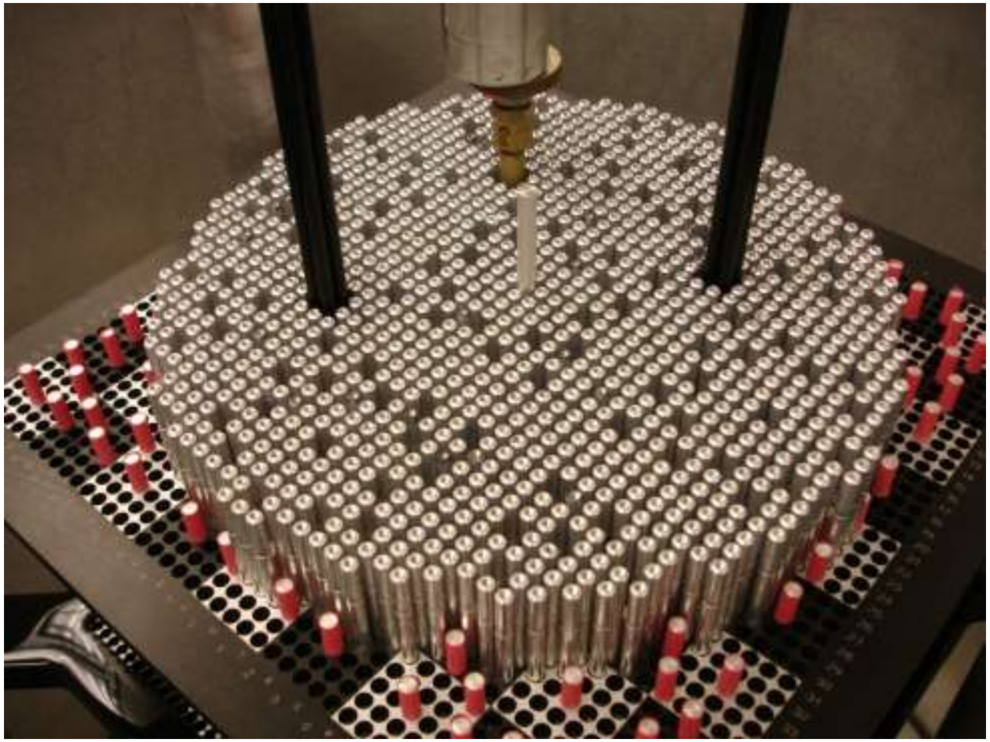


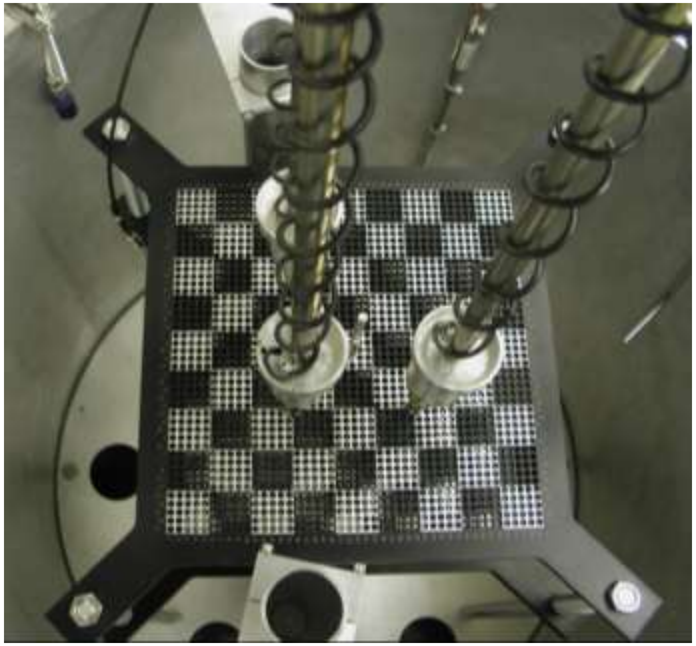
Approach to Critical Experiments

- Load to critical approach using inverse multiplication measurements
- Evaluate three key design parameters;
  - Target/fuel pitch,
  - Reflector design and
  - Moderator temperature feedback coefficient.
- Utilize the Sandia Critical Experiment Facility (SCXF)

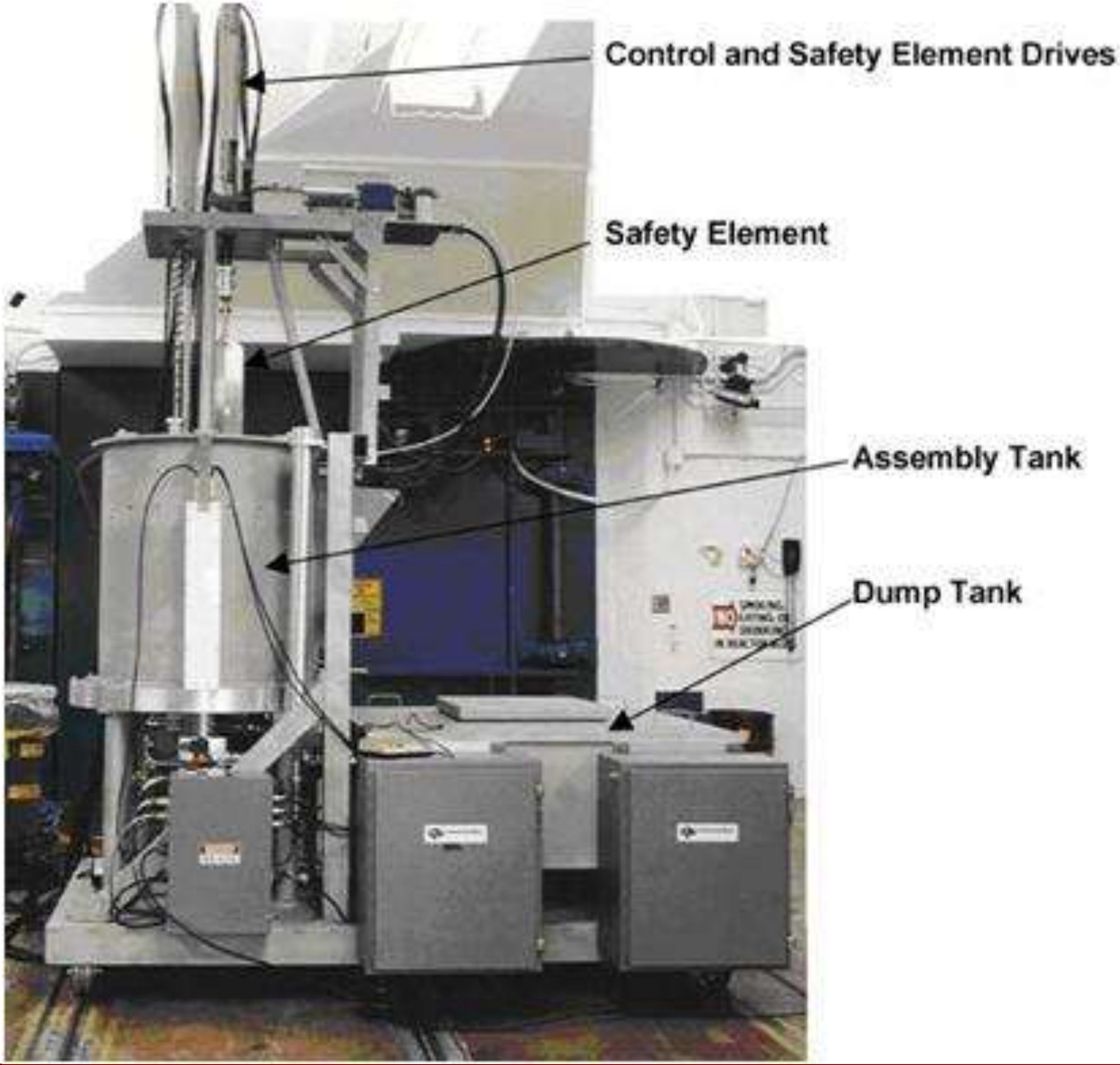
Sandia Critical Experiment Facility

Sandia Critical Experiment Facility





Sandia Critical Experiment Facility

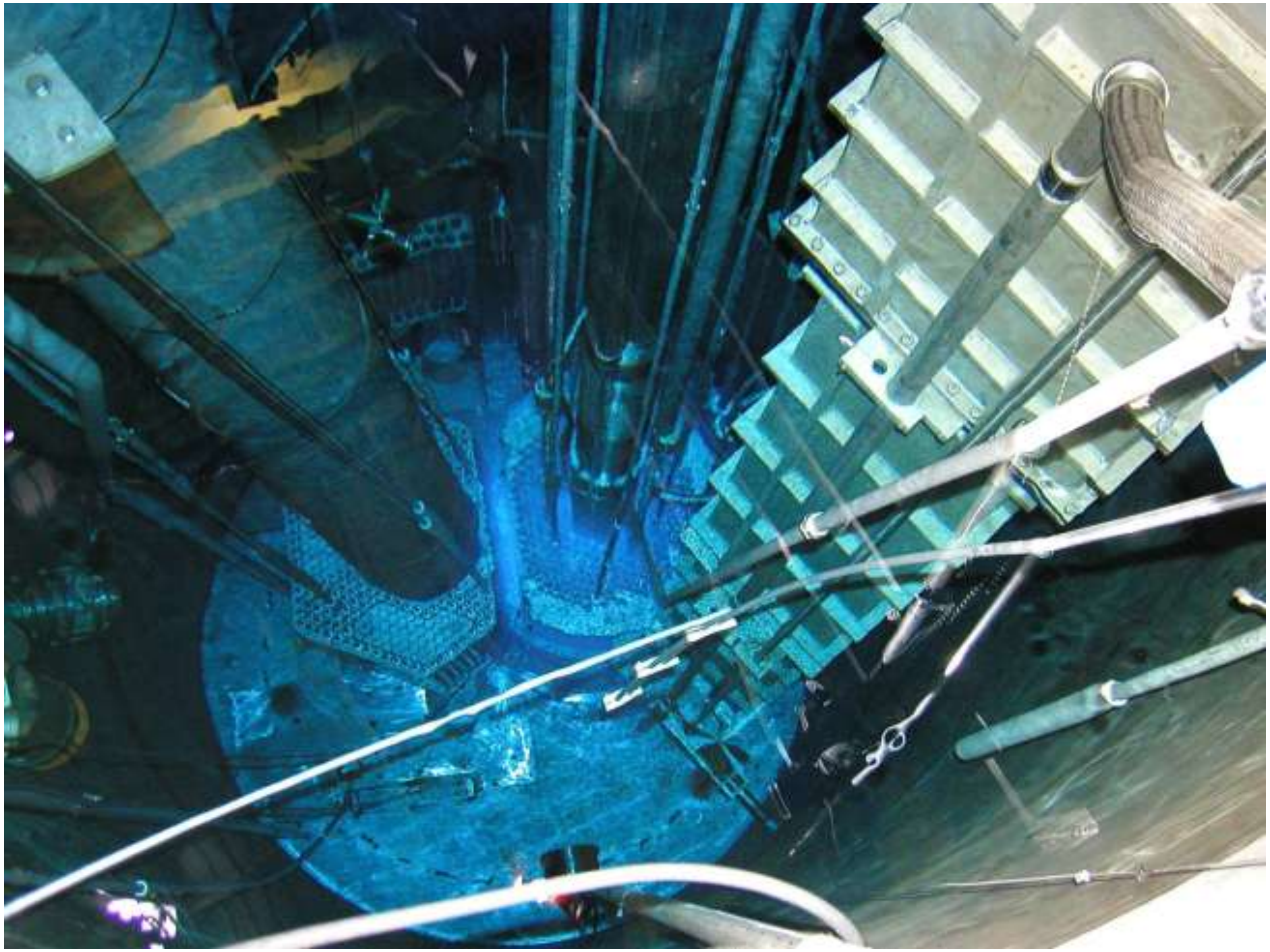


Target/Fuel Thermo-Hydraulic Tests

- **Open pool reactor power is limited by heat transfer from fuel/targets to coolant**
  - **Confirming the calculated Minimum Critical Heat Flux can be supported experimentally outside of a reactor core.**
  - **A tri-lattice of simulated inert (i.e. no fissile material) fuel/target elements will be setup in a deep (~6 m) pool.**
  - **The elements will be electrically heated to the range of peak element power calculated to occur during normal and accident conditions.**
  - **The average fuel/target element power is anticipated to be 10 kW per element up to a maximum of 38 kW. Based on calculations this would equate to a UO_2 matrix temperature of about 1200º C.**
  - **The coolant channel inlet temperature will be controlled to simulate a coolant loop return and the coolant channel outlet temperature will be measured.**

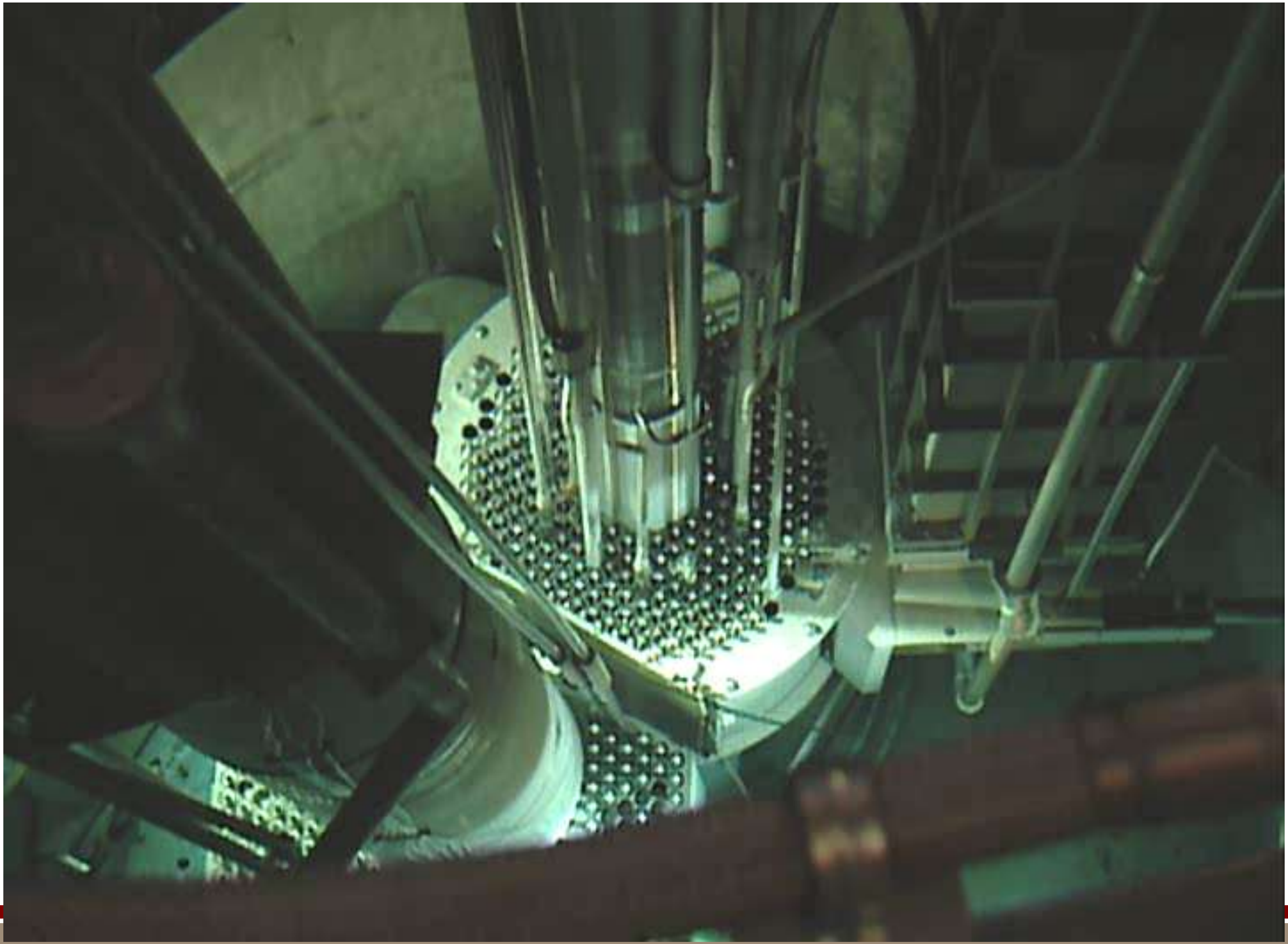
Burnup and Transient Fuel Tests

- **Sandia's Annular Core Research Reactor (ACRR)**



Annular Core Research Reactor(ACRR)

- **ACRR Pulse**



Conclusions

- A thorough and planned testing schedule for a medical isotope production reactor can be executed at Sandia National Laboratories.
- Approach to critical and low power testing will help establish key operating parameters of the reactor system.
- Out of core thermo-hydraulic tests will help establish reactor power limits.
- Burnup and transient tests can be conducted at Sandia's ACRR.
- The tests will validate design calculations, optimize the final design and support the licensing process.

Questions

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